

## PATENT COOPERATION TREATY

## PCT

## INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY


(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

REC'D 26 JAN 2006

WIPO

PCT

Applicant's or agent's file reference RJG/4237-WO	<b>FOR FURTHER ACTION</b>		See Form PCT/IPEA/416
International application No. PCT/GB2004/005406	International filing date (day/month/year) 22.12.2004	Priority date (day/month/year) 22.12.2003	
International Patent Classification (IPC) or national classification and IPC G01N27/30, H01M4/86			
Applicant UNIVERSITY OF BRIGHTON et al.			
<p>1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.</p> <p>2. This REPORT consists of a total of 5 sheets, including this cover sheet.</p> <p>3. This report is also accompanied by ANNEXES, comprising:</p> <p>a. <input checked="" type="checkbox"/> sent to the applicant and to the International Bureau) a total of 2 sheets, as follows:</p> <p><input type="checkbox"/> sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).</p> <p><input type="checkbox"/> sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.</p> <p>b. <input type="checkbox"/> (sent to the International Bureau only) a total of (indicate type and number of electronic carrier(s)) , containing a sequence listing and/or tables related thereto, in computer readable form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).</p>			
<p>4. This report contains indications relating to the following items:</p> <p><input checked="" type="checkbox"/> Box No. I Basis of the opinion</p> <p><input checked="" type="checkbox"/> Box No. II Priority</p> <p><input type="checkbox"/> Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability</p> <p><input type="checkbox"/> Box No. IV Lack of unity of invention</p> <p><input checked="" type="checkbox"/> Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</p> <p><input type="checkbox"/> Box No. VI Certain documents cited</p> <p><input type="checkbox"/> Box No. VII Certain defects in the international application</p> <p><input type="checkbox"/> Box No. VIII Certain observations on the international application</p>			
Date of submission of the demand  21.10.2005		Date of completion of this report  27.01.2006	
Name and mailing address of the international preliminary examining authority:  European Patent Office - P.B. 5818 Patentlaan 2 NL-2280 HV Rijswijk - Pays Bas Tel. +31 70 340 - 2040 Tx: 31 651 epo nl Fax: +31 70 340 - 3016		Authorized Officer  Wilhelm, J  Telephone No. +31 70 340-2633	



**INTERNATIONAL PRELIMINARY REPORT  
ON PATENTABILITY**

International application No.  
PCT/GB2004/005406

---

**Box No. I Basis of the report**

---

1. With regard to the **language**, this report is based on the international application in the language in which it was filed, unless otherwise indicated under this item.
- ☐ This report is based on translations from the original language into the following language , which is the language of a translation furnished for the purposes of:
- ☐ international search (under Rules 12.3 and 23.1(b))
  - ☐ publication of the international application (under Rule 12.4)
  - ☐ international preliminary examination (under Rules 55.2 and/or 55.3)
2. With regard to the **elements\*** of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report)*:

**Description, Pages**

1-19 as originally filed

**Claims, Numbers**

1-22 filed with the demand

**Drawings, Sheets**

1/5-5/5 as originally filed

- ☐ a sequence listing and/or any related table(s) - see Supplemental Box Relating to Sequence Listing
3. ☐ The amendments have resulted in the cancellation of:
- ☐ the description, pages
  - ☐ the claims, Nos.
  - ☐ the drawings, sheets/figs
  - ☐ the sequence listing (*specify*):
  - ☐ any table(s) related to sequence listing (*specify*):
4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).
- ☐ the description, pages
  - ☐ the claims, Nos.
  - ☐ the drawings, sheets/figs
  - ☐ the sequence listing (*specify*):
  - ☐ any table(s) related to sequence listing (*specify*):

\* If item 4 applies, some or all of these sheets may be marked "superseded."

**INTERNATIONAL PRELIMINARY REPORT  
ON PATENTABILITY**

International application No.  
PCT/GB2004/005406

---

**Box No. II Priority**

---

1. ☐ This report has been established as if no priority had been claimed due to the failure to furnish within the prescribed time limit the requested:
- ☐ copy of the earlier application whose priority has been claimed (Rule 66.7(a)).
  - ☐ translation of the earlier application whose priority has been claimed (Rule 66.7(b)).
2. ☐ This report has been established as if no priority had been claimed due to the fact that the priority claim has been found invalid (Rule 64.1). Thus for the purposes of this report, the international filing date indicated above is considered to be the relevant date.
3. Additional observations, if necessary:
- see separate sheet**

---

**Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

---

1. Statement

Novelty (N)	Yes: Claims	4-8,13-15
	No: Claims	1-3,9-12,16-22
Inventive step (IS)	Yes: Claims	
	No: Claims	1-22
Industrial applicability (IA)	Yes: Claims	1-22
	No: Claims	

2. Citations and explanations (Rule 70.7):

**see separate sheet**

**INTERNATIONAL PRELIMINARY  
REPORT ON PATENTABILITY  
(SEPARATE SHEET)**

International application No.

PCT/GB2004/005406

**Re Item II**

**Priority**

The range defined in claims 5, 6, 14 and 15 is not disclosed in the priority document, the priority for these claims is therefore invalid.

**Re Item V**

**Reasoned statement with regard to novelty, inventive step or industrial applicability;  
citations and explanations supporting such statement**

1. Reference is made to the following document:  
D1: CAGNINI A ET AL: "Disposable ruthenized screen-printed biosensors for pesticides monitoring", SENSORS AND ACTUATORS B, ELSEVIER SEQUOIA S.A., LAUSANNE, CH, vol. 24, no. 1-3, March 1995 (1995-03), pages 85-89, XP4302108, ISSN: 0925-4005  
D2: US4044193 (PETROW ET AL) 23 August 1977 (1977-08-23)
2. Independent claims 1, 10 and 18-21
  - 2.1. The subject-matter of independent claims 1 and 10, an electrode comprising a composite of metallised carbon and an insulator, and a method for making such an electrode, is disclosed in document D1 and also in document D2, and therefore not new in the sense of Article 33(2) PCT.
  - 2.2. The available prior art does not disclose the use of a metallised, particularly ruthenised carbon-insulator composite electrode in a chlorine sensor. However, it is certainly possible to use the electrode known from D1 as a chlorine sensor. Thus, the subject-matter of claims 18-21 is not new (Article 33(2) PCT).
3. Independent claims 7 and 8

As mentioned in point 2.2 above, the use of a metallised carbon-insulator composite

electrode in a chlorine sensor is not known from the prior art. However, the application discloses only a ruthenised carbon-insulator composite electrode as being particularly suitable for chlorine detection.

The broadly defined subject-matter of claims 7 and 8, which refer to the use of any metallised carbon-insulator composite electrode for chlorine detection, can therefore not be considered as a solution of a technical problem.

Thus, the subject-matter of claims 7 and 8 does not involve an inventive step in the sense of Article 33(3) PCT.

4. Independent claim 9

The use of a metallised carbon-insulator electrode as a component in a fuel cell is known from document D2 (example 1), the subject-matter of claim 9 is therefore not new in the sense of Article 33(2) PCT.

5. Dependent claims

Dependent claims 2-6, 11-17 and 22 do not contain any features which, in combination with an independent claim to which they refer, meet the requirements of the PCT in respect of novelty and/or inventive step (Article 33(2)(3) PCT).

CLAIMS

1. An electrode comprising a metallised carbon-insulator composite.
2. An electrode as claimed in claim 1, wherein the metallised carbon-insulator composite is a ruthenium modified carbon-insulator composite.
3. An electrode as claimed in claim 1, wherein the metallised carbon-insulator composite is a platinum or rhodium modified carbon-insulator composite.
4. An electrode as claimed in any one of claims 1 to 3, wherein the metallised carbon-insulator composite is a metallised carbon-epoxy composite.
5. An electrode as claimed in any one of claims 1 to 4, wherein the volume fraction of the metallised carbon in the metallised carbon-insulator composite is in the range of 15 to 45%.
6. An electrode as claimed in claim 1, wherein the volume fraction of the metallised carbon in the metallised carbon-insulator composite is in the range of 15 to 45% and the metallised carbon-insulator composite is a ruthenium modified carbon-epoxy composite.
7. The use of the electrode as claimed in any one of claims 1 to 6, in the detection and/or measurement of chlorine.
8. The use of the electrode as claimed in any one of claims 1 to 6, in the detection and/or measurement of free available chlorine by electrolysis.
9. The use of the electrode as claimed in any one of claims 1 to 6, as a component of a fuel cell, primary or secondary cells for batteries, electrolyzers and electrochemical reactors.
10. A method for the manufacture of an electrode as claimed in any one of claims 1 to 6, which comprises the preparation of a metallised carbon-insulator composite.
11. A method as claimed in claim 10, wherein the metallised carbon-insulator composite is a ruthenium modified carbon-insulator composite.
12. A method as claimed in claim 10 or claim 11, wherein the metallised

carbon-insulator composite is a platinum or rhodium modified carbon-insulator composite.

13. A method as claimed in any one of claims 10 to 12, wherein the metallised carbon-insulator composite is a metallised carbon-epoxy composite.
14. A method as claimed in any one of claims 10 to 13, wherein the volume fraction of the metallised carbon in the metallised carbon-insulator composite is in the range of 15 to 45%.
15. A method as claimed in claim 10, wherein the volume fraction of the metallised carbon in the metallised carbon-insulator composite is in the range of 15 to 45% and the metallised carbon-insulator composite is a ruthenium modified carbon-epoxy composite.
16. A chlorine sensor incorporating an electrode as claimed in any one of claims 1 to 6.
17. A free available chlorine sensor incorporating an electrode as claimed in any one of claims 1 to 6.
18. A chlorine sensor incorporating an electrode made from a ruthenium modified carbon-epoxy composite.
19. A free available chlorine sensor incorporating an electrode made from a ruthenium modified carbon-epoxy composite.
20. A chlorine sensor incorporating an electrode made according to the method of any one of claims 10 to 15.
21. A free available chlorine sensor incorporating an electrode made according to the method of any one of claims 10 to 15.
22. A sensor as claimed in any one of claims 16 to 21, wherein there are two or more electrodes arranged in parallel.